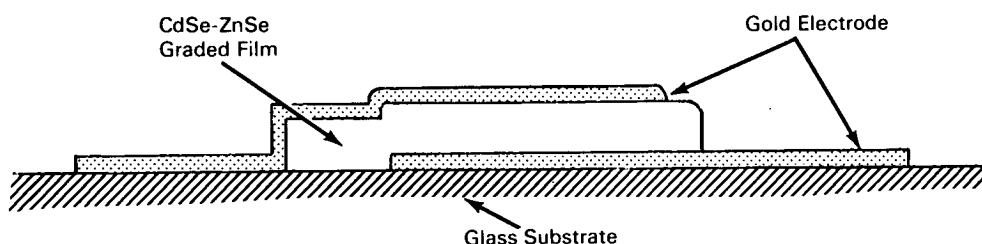


NASA TECH BRIEF



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Thin-Film Semiconductor Rectifier Has Improved Properties



The problem:

To develop an improved thin-film semiconductor rectifier.

The solution:

A cadmium selenide (CdSe)-zinc selenide (ZnSe) film is vapor-deposited in a controlled concentration gradient onto a glass substrate to form the required junctions between vapor-deposited gold electrodes.

How it's done:

The relative proportions of CdSe and ZnSe along the thickness of the semiconductor film are varied by controlling the vapor-deposition process. In this manner, the CdSe concentration will be greater at one boundary than at the other boundary of the semiconductor film where junctions are formed with the vapor-deposited gold emitter and collector electrodes. The junction between the CdSe-rich portion of the semiconductor film and one gold electrode will present a relatively low energy barrier, whereas the junction between the ZnSe-rich portion of the semiconductor film and the other gold electrode will present a relatively large energy barrier.

The magnitude of the larger energy barrier, which

primarily determines the current that can be passed through the rectifier, can be varied by an applied potential to produce an asymmetrical current-voltage characteristic. The relationship between the log of the current and the square root of the voltage is linear up to a voltage determined by the ZnSe-rich boundary.

Notes:

1. Tests on rectifier samples (0.058 cm² in area) made by this procedure yielded the following results:

Static rectification ratio at 0.4 volt	10 ⁵
Forward resistance	100 ohms
Reverse breakdown potential	7 volts
Forward breakdown potential	0.3 volt
Leakage current at 4 volts reverse bias	less than 1 microamp
Maximum forward current density	2 amp/cm ²
Shelf life (room temperature)	2000 hours

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Manned Spacecraft Center
P.O. Box 1537
Houston, Texas, 77001
Reference: B66-10012

(continued overleaf)

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Melpar, Inc., under contract to
Manned Spacecraft Center
(MSC-207)